



Submeter mapping of methane seeps by ROV observations and measurements at the Hikurangi Margin, New Zealand

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During R.V. Sonne cruise SO191-3, part of the “New (Zealand Cold) Vents” expedition, RCMG deployed the CHEROKEE ROV “Genesis” at the Hikurangi Margin. This accretionary margin, on the east coast of New Zealand’s North Island, is related to the subduction of the Pacific Plate under the Australian Plate. Several cold vent locations as well as an extensive BSR, indicating the presence of gas hydrates, have been found at this margin. The aims of the ROV-work were to precisely localize active methane vents, to conduct detailed visual observations of the vent structures and activity, and to perform measurements of physical properties and collect samples at and around the vent locations.

The data obtained during the seven ROV dives has been integrated with data from other TV-guided equipment deployed or towed over the covered areas. Two areas were investigated (Faure site & LM-3 site); both generally have a flat to moderate undulating sea floor with soft sediments alternating with carbonate platforms. Active bubble-releasing seeps were observed at the Faure and LM-3 areas. These were the first ever visual observations of bubbling seeps at the Hikurangi Margin. At Faure site six different seep clusters have been discovered within a 2500 m² active area during three separate dives. Bubble-releasing activity was very variable in time, with periods of almost non-activity alternating with periods of violent outbursts. These violent out-

bursts were accompanied by the displacement of sediment grains and the formation of small depressions showing an initial stage of pockmark formation. Bottom-water sampling at the seep sites revealed methane concentrations of up to five volume percentage of the extracted total gas volume. At the LM-3 site only one very small, single bubbling seep was observed during one of the two dives at this site. At both sites, bubble release occurred mainly from prominent depressions in soft-sediment sea floor away from the carbonate platforms. Comparable depressions, but without bubble release, have been observed throughout both areas. The present carbonate platforms together with the depressions indicate that seepage on longer time scales seems much more common than we have observed. Both sites are covered with dense fields of shell debris and with local sponges and/or soft tissue corals in association with carbonate platforms. Only at the LM-3 site, which consists of a large carbonate platform, live clams occur, often in association with tube worms. Sediment-temperature measurements, in both areas, were largely comparable with the bottom-water temperature except for one LM-3 site that was densely populated by polychaetes, where anomalous low sediment-temperature was measured.

Further analysis of the ROV data together with the integration of other datasets will lead to a complete characterization of the seep structure and environment which will show the real extend of the present active seep areas. Overall it is clear that the present seeps areas are very confined in space and that the active seep sites have shifted in location over time.